15721 Project 3 - Networking Final Presentation

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Overview

75% - Fix and improve the Wire Protocol in Peloton ✔

Add Unit tests for the Wire Protocol ✔

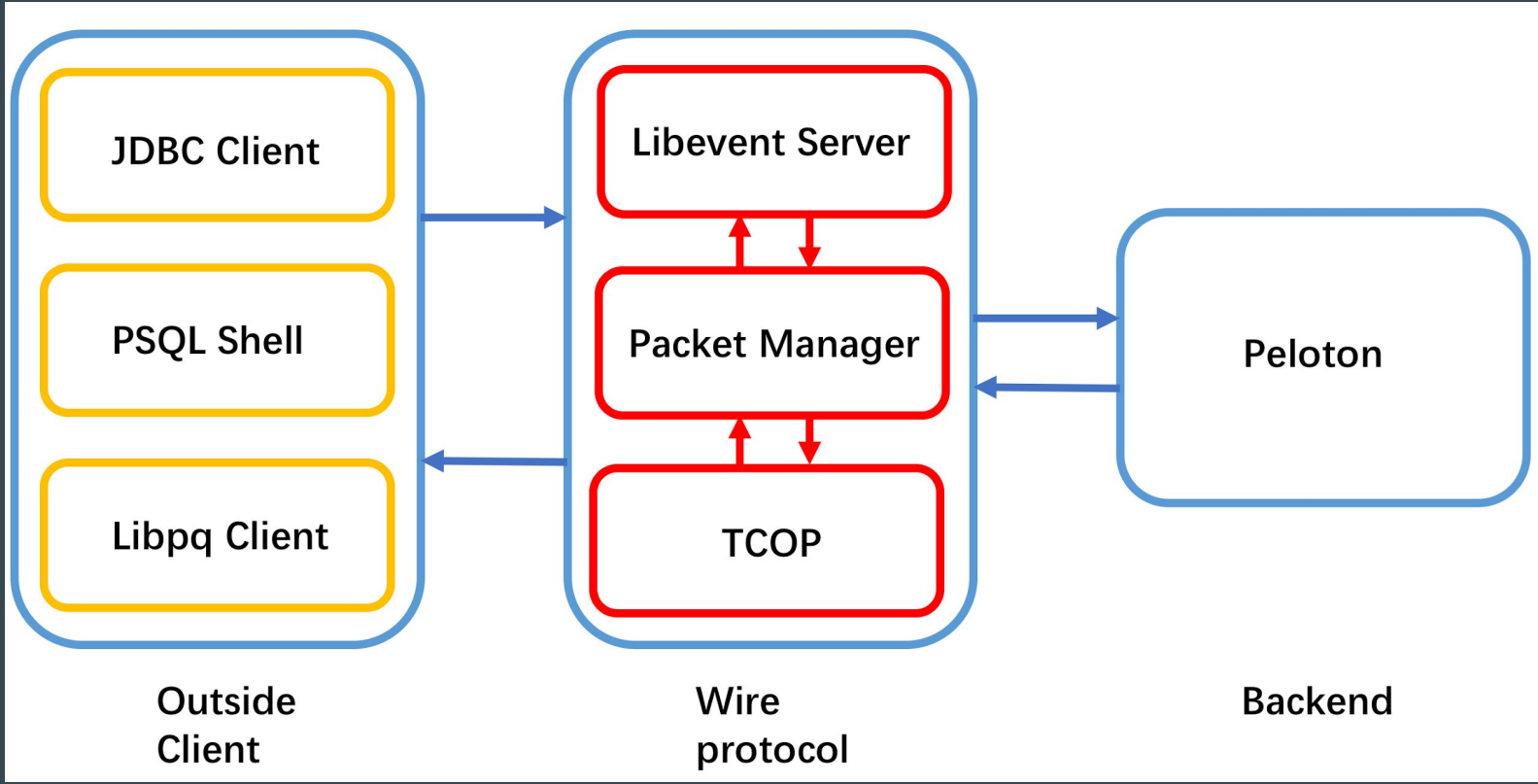
100% - Performance test with benchmark data sets ✔

Performance profiling of wire protocol ✔

Add Support for SSL

125% - Basic connector for Memcached

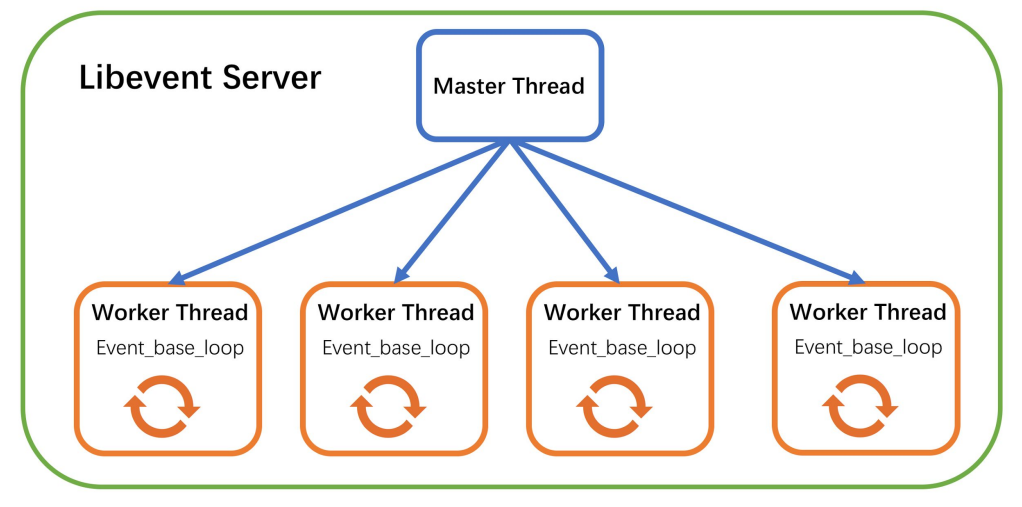
Project Flow



Wire Protocol Fix

Memory Leak

- Complete Libevent Server's destructor
- Free event base and event



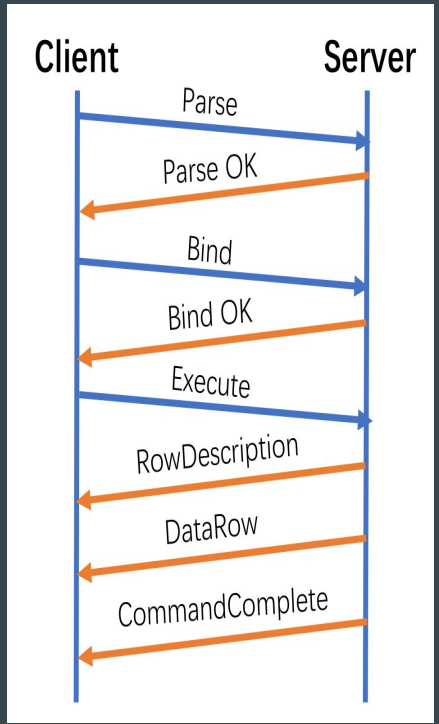
Wire Protocol Fix

Support prepare statement for Libpq

- Previous wire protocol in Peloton does not support prepare statement from Libpq and PSQL Shell.
- Libpq send parse message without parameter types.
- Improve Bind message process function to handle this corner case.

Parse

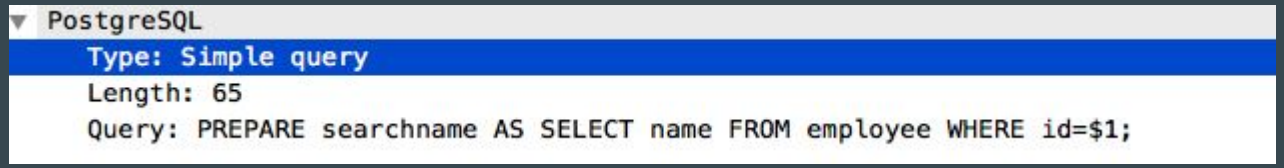
'P'	int32 len	str stmt	str query	int16 numparams	int32 paramoid	...

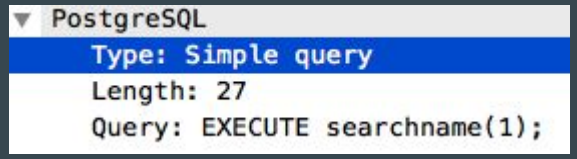


Wire Protocol Fix

Support prepare statement for PSQL Shell

- PSQL Shell uses Simple Query to create and execute prepare statement.



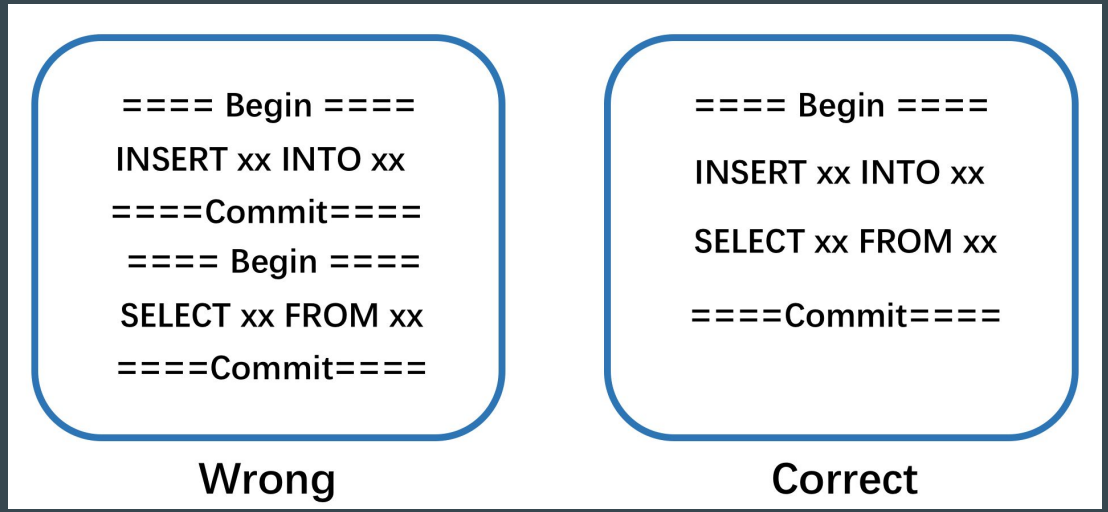


- Improve Simple Query message process to support Prepare and Execute query types.

Wire Protocol Fix

Single Statement Transaction

- Every statement execute in single statement transaction.
  - Tcop does not begin a transaction correctly



Wire Protocol Fix

Transaction Abort Bug

- There are outstanding transactions when oltpbench has finished execution.
  - Garbage Collection cannot work correctly because of these outstanding transactions.
- A few single statement transactions do not commit or abort in Tcop's ExecuteStatementPlan.

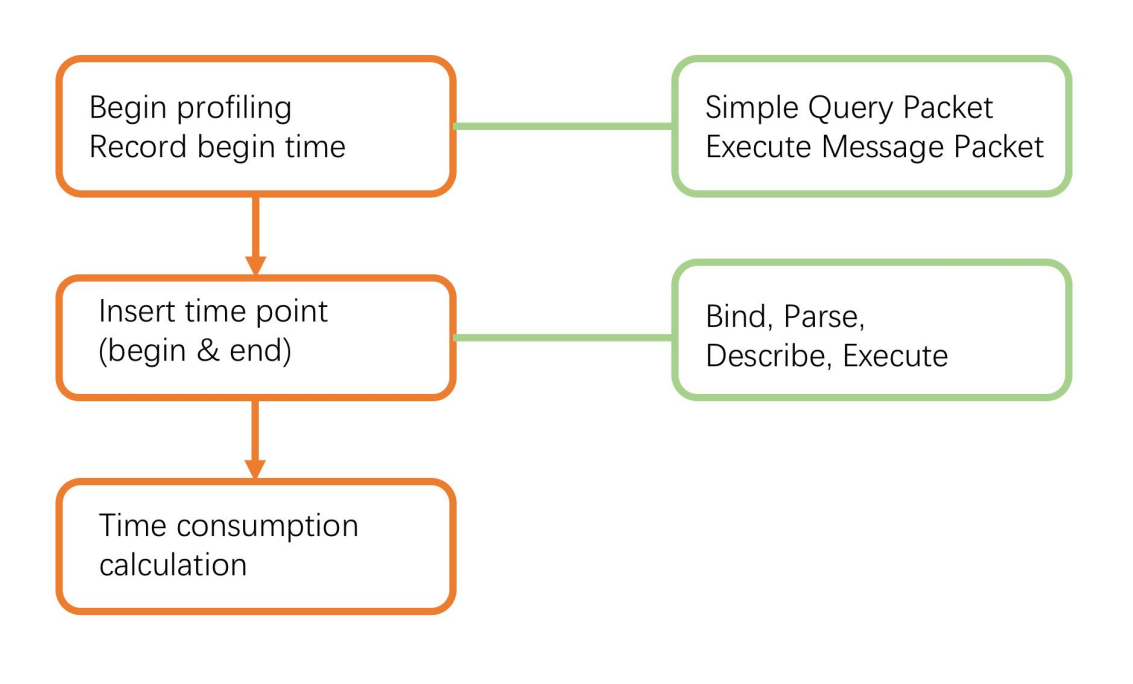
Workload

- YCSB - 100% updates, 20 terminals, 100000 tuples and 100 sec runtime
- No outstanding transactions

Unit Test

- Simple Query Test
  - Libpqxx client
  - Simple query without prepare statements
- Prepare Statement Test
  - Libpqxx client
  - Prepare statements
- Rollback Test
  - Test server and client's behavior when a txn abort happens
- Multiple Server Test
  - Stress test, servers have different ports

Profiling: Profiler class



Profiling: simple query packet

100 iterations	Average Run Time (us)	Average Build Plan Tree Time (us)
BEGIN	664	34
DROP TABLE	1965	862
CREATE TABLE	14380	56
INSERT	880	381
SELECT	15852	327

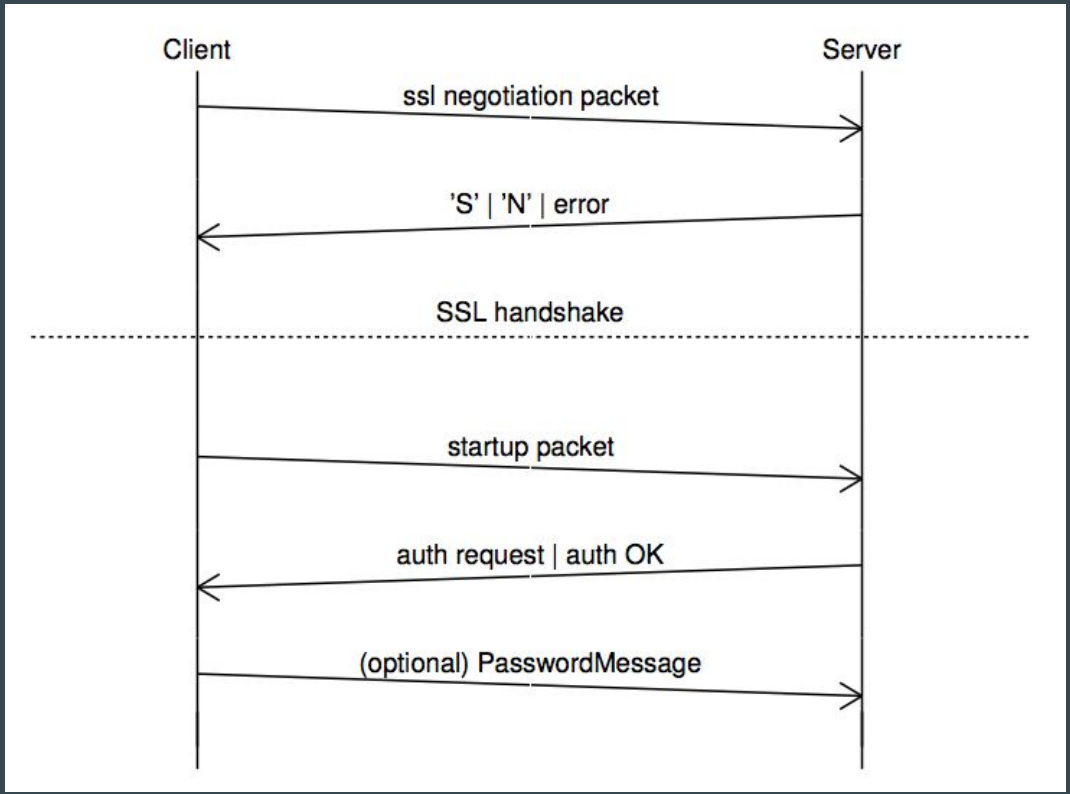
Profiling: prepare statement packets

100 iterations	Average Run Time (us)
PARSE	1577
BIND	178
DESCRIBE	33
EXECUTE	184

Performance Test

- Number of queries wire protocol handles per 1 second
  - Measured at libpqxx client side
  - Without prepare statement
    - 115 queries/s
  - With prepare statement
    - 4311 queries/s
- Able to run YCSB benchmark with profiler without seg fault or outstanding txns.

SSL Message Flow in Wire Protocol



Routine to Deal with SSL Connection

1. Initialize SSL context in Libevent server ✔
2. Identify the first message from client (Startup or SSL request) ✔
3. Send back S/N/error for SSL request ✔
4. Perform SSL handshake with openssl API ???
5. Use SSL_read() and SSL_write() with socket buffer ...

Future Plans

- More tests to the TXN abort bug.
- Use YCSB benchmark to do more performance tests
- Solve SSL handshake error and complete the entire SSL procedure.
- Add Memcache connector.

Thanks!